AN ADDRESS

BEFORE THE STUDENTS OF THE

Pardee Scientific Department

IN

LAFAYETTE COLLEGE,

BY

P. W. SHEAFER,

MEMBER OF THE BOARD OF EXAMINERS OF THE PARDEE SCIENTIFIC DEPARTMENT IN LAFAYETTE COLLEGE.

DELIVERED AT THE OPENING OF THE COLLEGE YEAR, SEPT. 5, 1872.

EASTON, PENN'A.
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EXTRACT FROM THE MINUTES OF THE FACULTY OF LAFAYETTE COLLEGE, SEPTEMBER 9, 1872.

"*Resolved*, That the thanks of the Faculty be presented to Mr. P. W. SHEAFER, for his Address, delivered last Thursday, before the students of the Pardee Scientific Department, and that he be requested to furnish a copy of the same for publication."

Printed by ALFRED MARTIEN, Philadelphia.

Young Gentlemen:

The subject which will engage our attention for a short time this morning, is the remains of the great tropical forest, which in remote ages covered so large a portion of our Continent, having for its eastern boundary, perhaps, our South Mountain (a part of the Blue Ridge chain,) and thence stretching westward far beyond the Mississippi, while its range north and south extended from the Lakes to the Mexican Gulf.

The age of the coal-deposits is one of those serious problems which we may say are past finding out. We cannot even guess at it within a million years. But we can fix the relative age of our "black but comely" giant. It is one of God's latest, as it is one of His best gifts to man. It is much younger than gold and silver, younger than iron or any of the baser metals, younger than the precious stones, younger than coal-oil—which comes from the shales below the coal—younger even than the limestones, those wonderful remains of *animal*, as coal is of *vegetable* life—except the few layers which are found among the carboniferous rocks. How young, and yet how amazingly old is our King Coal! Even after the lapse of countless ages had laid the foundation and prepared the bed for the mighty forests of the carboniferous era, millions of years must have been required for the growth of those forests, their decay and submergence, the deposition of their slaty covering, the growth of new masses

of vegetation, and the rotation of this slow machinery during all the process of forming the twenty or more beds, small and great, of the Anthracite series; together with the interstratified sandstones, limestones, shales, conglomerates, etc., all of which were formed by the slow process of deposition, and all of which tend to render more hopeless the effort to conceive of the length of time required for the formation of this single group of strata.

The "Mammoth" bed of Schuylkill county, after having been compressed until almost crystallized, and until the growth of a generation is reduced to little more than a film, still averages twenty-five feet in thickness, over a territory nearly one hundred miles in length, and must, alone, have required ages for its production, even allowing, as we must, for the rapid and continuous growth of a tropical forest.

That the coal deposits are all, comparatively speaking, of the same age and formed in the same way, is shown by the remarkable uniformity of the fossil plants found in them. These are identical, not only in all the Anthracite and Bituminous coals of the United States and the British Provinces, but even in England and on the Continent of the Old World.

We magnify the importance of Coal in our country; *first*, because of its value as a fuel; and, *second*, because of the vast supply stored here. The first point no longer needs demonstration. Since that day in 1812, when the workmen at White and Hazard's

nail-works, at the Falls of Schuylkill, left their furnaces in a rage because they could not make the "black stones" burn, and returned to find that during their absence they had nearly melted down the furnace doors, Anthracite Coal has stood without a rival upon earth. Practical as well as analytical tests have failed to find an acceptable substitute. Neither wood, nor peat, nor oil, nor any other substance contains pure carbon in so condensed and cheap a form, says Professor Jevous; and Professor Tyndall adds: "I see no prospect of any substitute being found for Coal as a source of motive power. We have, it is true, our winds, and streams, and tides; and we have the beams of the sun. But these are common to all the world: we cannot make head against a nation which, in addition to these sources of power, possesses the power of Coal."

Prof. Tyndall further says: "We should have, in my opinion, no choice whatever in a race with a nation which, in addition to abundant Coal, has energy and intelligence approximately equal to our own,"—a significant admission from an authoritative source. England must soon yield to America in the great competition of the nations. The strength of both is in their *coal mines*, and in England these have already reached nearly or quite their maximum of production, while our Anthracite is but partially developed, and our Bituminous Coals are scarcely touched. The great body of our present coal supply lies within five hundred feet of the

surface, while the depth to which English miners are obliged to go is best seen from a statement of their principal shafts:

The Houghton Pit is 780 feet in depth.

The North Seaton Pit is 744 feet in depth.

The Ryehope Colliery is 1,680 feet in depth,

and the Dunkenfield was sunk to a depth of 2,060 feet, at an expense of $500,000 in money and ten years of time, mainly to reach the "Black Mine Coal," a bed 4 feet 8½ inches thick. Compare this with the "Hickory Shaft," near Pottsville, the deepest working shaft in America. This shaft, which is 666 feet deep, cost $100,000, was sunk in 428 working days, and developed 76 feet of coal.

The English people are now discussing the probable depth to which they can follow their coal seams. Professor Jevous "shrinks from endorsing the 4,000 feet theory," but stops short at 2,500, and says when they reach that depth a complete supply of coal will come in from Pennsylvania. We have superior advantages in working our Anthracite coals, from the inclination of the beds and their consequent cropping out on the surface. We find solid coal within twenty to fifty feet of the soil, and sinking our slopes in the coal itself, at a cost of not more than $100 per yard, exhaust the first set of coal chambers, and then, sinking one hundred yards deeper, make a new set, and so go on until we reach the bottom of the basin. This is far cheaper and more expeditious than the deep

shafts which the English are obliged to sink vertically through hard rocks, intercepting all the water courses which lie between the strata, and thus adding a heavy expense for drainage to the dead loss of capital in removing unremunerative material. The great Monkwearmouth Pit was only completed after twenty years' labor; our energetic Americans sink their slope, build a breaker, put up miners' houses, pumps, engines, etc., in one year, and the next are shipping coal.

A good idea of the extent of our Anthracite resources may be gained from a single illustration. The Mahanoy Valley, in Schuylkill County, Pennsylvania, is about twenty miles in length by half a mile in width. In this area there are twenty-five collieries, and these will produce, on an average, 2,000,000 tons of coal annually, for the next fifty years. All this from a single synclinal trough containing about one-fortieth of our Anthracite coal area.

But though Pennsylvania's store of Anthracite will last for many years, and long after it is drawn upon to supply England, it is useless to deny that there is a limit to the supply, and that, after a time, it will be exhausted. Then what shall we do?

We shall proceed to open the grand reservoir, the Bituminous coal-fields, compared to which our Anthracite beds are but as a mill-pond to the Gulf of Mexico. With a Bituminous area of 12,000 square miles in Pennsylvania, and 197,000 in the United States, we can supply the world with fuel for ages to come.

And after the Bituminous, what? Brown coal—Lignite—that queer, woody-looking mineral, little known as yet, but already beginning to be used, and destined to play an important part in the world's great drama, long ages hence. With this, as with the other coals, America is still the favored land. It is found from Behring's Straits to Salt Lake City, and again, in Tehuantepec, Panama, Peru, and from Chili to Patagonia. But it also occurs in many other parts of the earth. It stretches in almost a continuous belt across half the world, from France to China. It is found in Australia, Van Dieman's Land, Sumatra, Borneo, and probably in many other countries where the bowels of the earth have not yet been explored.

So we shall not lack for fuel *very* soon. The main point, however, is that Pennsylvania holds the key to these vast store-houses of fuel, and consequently to the workshops of the world. Her supreme command of the world's supply of Anthracite, and her rich deposits of iron, give her a prestige which she will never lose.

Widely distributed though the coals and metals are, a glance at a map of the world on which their areas are defined, will show how insignificant is the space they occupy, when compared with those parts of the earth from which they are absent. It has always been the case that the nations best supplied with these treasures, and which knew best how to use them, have held the commercial supremacy of the world. Where

these truly "internal resources" go, wealth and influence are sure to follow. The distribution of fuels is almost entirely, and that of metals to a great extent, in the northern hemisphere; and the northern hemisphere is the field in which all the arts and sciences are cultivated. In the United States, a belt four degrees in width, say 258 miles wide and 2,600 long, containing 670,800 square miles, say but one-fifth of our total area, having for its medial line the fortieth degree of north latitude, and running from the Atlantic to the Pacific, embraces the most of the great coal and ore beds; and it is precisely within this belt that the main railroads and canals, the Pacific road from Omaha to the Sierra Nevada, the great centres of industry, the principal commercial and manufacturing cities, are to be found. New York, Philadelphia, Pittsburgh, Columbus. Indianapolis, Springfield (Illinois), Denver, and Salt Lake City are all nearly in the middle of this belt; while Boston, Chicago and San Francisco are just outside of it. The fortieth degree of north latitude may indeed be called the backbone of the United States, and Pennsylvania, holding a central position on this belt, with one hand on the inter-ocean highway of the nations and the other on the magnificent river system of the Mississippi Valley, having her lap filled with the country's choicest mineral wealth, well merits the proud title of the Keystone State, for she both *binds* and *crowns* the Union.

With the appliances of modern chemistry we can so condense an ox that he can be carried in a hand-basket, and so to-day we find a mighty tree of a past era reduced to a scuttle of coals. We find the sunshine of the past concentrated in a tropical growth, and long stored up in the hidden places of the earth, now lighting all our houses, its heat driving our locomotives with the speed of the wind and carrying our burdens with the strength of an army of giants. Think of a single locomotive performing in a day the work of ten thousand camels on the Arabian sands! Well may we be thankful for these vast granaries—so well filled by our Joseph, during the years of plenty, that when the lean kine devoured the forests that were on the earth, and the years of famine came, we had abundance in store for all the nations.

It is so well located, too, this power-treasure of ours; placed near the great centres of commerce, with a Divine foresight that just here it would be most needed; river channels opening for it pathways to the sea; mountain walls cloven asunder to lay their black diamonds open to the miner's hand; and again, that the whole land might share in the blessing, vast deposits underlying the western plains, where no forests wave and man can find no other fuel.

Nor must we think of this warmth-and-light-giving coal as a creature comfort only. It preserves the life and energy of nations. Professor Tyndall says the destiny of the English nation "is not in the hands of

its statesmen, but in those of its coal owners; and while the orators of St. Stephen's are unconscious of the fact, the life-blood of the nation is flowing away." The fearful amount mined from English soil gives that nation no little concern; so much, indeed, that one of its writers is constrained to offer no better consolation than this: "*Economy* will reduce our consumption; the *burning of waste heaps* of coal will be stopped. *America* will relieve us from the world-wide demand for our coal, and will, eventually, furnish this country with as much as we want." Let us see, now, how the coming demand upon America's resources is to be met.

In our estimates of the areas of the Anthracite coal fields of Pennsylvania, we place that of the

Southern coal field at . .	146	square miles,
Of the *Shamokin* district, .	50	" "
Of the *Mahanoy* " . .	41	" "
Of the *Upper Lehigh* field, .	35	" "
Of the *Wyoming and Lackawanna* field, . .	198	" "
Total, . .	470	square miles,
	or, 300,800	acres.

Averaging the total coal thickness of the Southern coal field at 75 feet, and that of the Middle and Northern fields at 43 feet, we have a total content (one cubic yard equalling one ton) of, say, 26,361,076,000 tons

Deduct one-half for waste in mining, preparing, and faults, 13,180,538,000 tons.

and we have a net result of 13,180,538,000 tons.

The amount mined from 1820 to 1870, the first fifty years of the Anthracite coal trade, was 206,666,325 tons; so that we have yet in store 12,973,878,675 tons.

The progress of our coal trade is thus shown:*

In 1820 the production was	. .	365 tons.
From 1820 to 1830,	. . .	533,194 "
" 1830 to 1840,	.	5,406,711 "
" 1840 to 1850,	.	15,952,893 "
" 1850 to 1860,	.	42,088,644 "
" 1860 to 1870,	.	50,337,354 "

To estimate the future consumption, we must also consider the increase of our population.

In 1830 our population was nearly thirteen millions, (12,866,020;) the consumption of Anthracite being at the rate of one ton to twenty-four persons.

In 1840 the population was 17,069,453, and the consumption one ton to three persons.

In 1850 our population was over twenty-three millions, (23,191,876,) and the consumption not quite one ton per capita.

In 1860 the population was over thirty-one and

* See the valuable diagram prepared by Mr. Sheafer, and appended to this address. The Trustees of the College also take this opportunity of expressing their obligations to Mr. Sheafer for his donation to the College of the series of valuable models prepared by him, exhibiting not only the coal beds of the Anthracite region, but all the prominent physical features of this section of our country.

a half millions, (31,641,977,) and the consumption about two tons per capita.

And in 1870 the population was thirty-eight and a-half millions, (38,555,983,) while the consumption of Anthracite coal had reached a ratio of three tons to each individual.

The consumption during the last decade hardly equals our expectation. From 1840 to 1850, it increased 15,952,893 tons, or at the rate of one and three-tenth millions per annum. From 1850 to 1860, the increase was 42,088,644, or three and five-tenths millions per annum. From 1860 to 1870, the increase was 50,337,354, or four and two-tenths millions per annum.

At the rate of fifteen million tons per annum, our supply of Anthracite Coal alone will last two thousand six hundred years; the English at its present rate of consumption—say one hundred million tons a year—will be exhausted in one hundred and thirty years. Their area has five thousand four hundred and nineteen square miles; about one-fortieth of ours.

We have hitherto been chiefly considering the Anthracite Coal. We must now turn our attention to the vast expanse of our Bituminous fields, of which Professor Rogers estimates that the United States contains not less than one hundred and ninety-six thousand eight hundred and fifty square miles, or about nine-tenths of the known coal area of the world. One of these coal fields extends from northeastern

Pennsylvania to Tuscaloosa, Alabama, a distance of eight hundred and seventy-five miles, with a maximum breadth of one hundred and eighty miles; making an area of fifty-five thousand five hundred square miles. "Comparisons are odious," oftentimes; but we cannot resist the temptation to make another just here:

The coal-fields of the British Provinces contain . . .	7,530 sq. miles.
Those of Great Britain, (England, Scotland, Wales and Ireland,)	5,400 " "
The Continent of Europe, . .	3,564 " "
And the United States, . .	196,939 " "
Total, . . .	213,433 " "

The British coal area equals five thousand four hundred and nineteen square miles; their production of coal has doubled in the last twenty years, and is now increasing at the rate of 2,750,000 tons per annum; while their estimates of its duration run from one hundred and seventy-two years upwards. With the exhaustion of their coals they sink deeper shafts; and these, with their labor troubles, and the great emigration to our shores, which renders competition less keen among the workmen —all tend to make coal mining in England more expensive, year by year. In view of these facts we anticipate an encouraging future for our coal trade, even at this hour of its depression. We can almost realize the time when we shall export coal for the world's supply; when the vessels of all nations shall throng our wharves;

when we shall not compete with pauper labor; when our home consumption of coal for the manufacture of iron shall assume gigantic proportions.

For why should we not manufacture as cheaply and *as well* as any other nation on the globe? We have more abundant resources than any; and all that is lacking is their proper development. The total product of our Anthracite and Bituminous mines now is but one-fifth that of England; her *export* alone for one year being nearly equal to our entire production of Anthracite for the same year. For centuries the British Isles have been the great storehouse for the world's supply of coal, iron, and other minerals. Their coal mined in 1870 exceeded one hundred and ten million tons, while our whole production of both Anthracite and Bituminous was but twenty-five millions. Their production of iron ore was fourteen million tons, and of pig iron nearly six millions, while our production of pig iron was less than two millions. We used in 1870, a little more than one million tons of railroad iron. We manufactured 620,000 tons, and imported 470,000 from England. Our total importations for 1870 amounted to $43,000,000. But while we are constantly growing stronger, England is as steadily growing weaker, and the contest for the manufacturing supremacy must soon terminate in our favor. Since the wages of the British miner have been increased and his hours of labor reduced to fair rates, the production of the English mines has decreased while its

cost has increased; besides, the future development of their coals will be more expensive, as they are obliged to sink deeper for them. Their product will now diminish, while ours will increase. The one item of cheap labor has long retarded the full development of our resources; now the tide has turned, and our nation is going forward with rapid strides. Our ships crowd every port, our canals reach every valley, and our railways are as numerous as turnpike roads. Already we have one iron link fastened at either end on the Atlantic and Pacific coasts and two others well under way, striding through the wilderness, bearing light and civilization to the now shadowy lands.

What thoughtful man will not make the contrast, when he considers our vast resources of Bituminous Coal, so widely spread; our Anthracite so concentrated in one State, near the seaboard; the iron ores of Lake Champlain on the one hand, those of Lake Superior and Missouri on the other, and the hematite and fossiliferous ores of Pennsylvania and the Franklinite of New Jersey, close at home—all gravitating toward a common centre, where lies the coal to fuse them. Considering these, and with them our limestone valleys, our forests of timber, the oil districts of Western Pennsylvania, and our railroad and canal systems—it needs no prophetic vision to mark the spot where the workshops of the world will be. Shall we place them far North, far South, far West,—or at a point of ready access to our great seaboard cities; easily reached from

all points by both rail and canal; on the great route of travel from the Pacific coast,—the route over which come alike the gold and silver of the far West, and the teas and silks of the far East? We venture the prediction that we do not stand to-day one hundred miles from the spot where the London and Liverpool of this continent will be. A giant power, uninfluenced by political parties, will place them where the elements which shall constitute their greatness are readily found and cheaply gathered for manufacture and distribution.

To build up our future metropolis we must have good and plentiful materials and cheap transportation. We must exact good work, and to secure it, must pay good wages, and not oppress the workman with exhausting servitude. Neither must he dictate what his wages shall be; for his labor he must receive a just recompense, and no more.

Another element required to build up our nation's greatness we must consider to-day. We must, above all, possess an intelligent and skilled direction and directors. In vain do we gather multitudes of men for war, and send them in confused masses against the enemy. Unless we marshal them under well-skilled leaders, they will accomplish nothing. To-day, Lafayette College and other institutions all over our land, we are proud to say, are equipping and preparing skilled officers to do effective service. Let each act well his part. With intelligence and indus-

try each man is sure to make his mark,—to take his place, and help on the great work before us.

Do you ask, what is this work? Look about you and see it. It is the work of carrying on the world. It is the work of *ennobling* the world. We must make it better and purer and holier for our having lived in it. The old theory of successive ages of gold, of silver, of bronze and of iron, was all wrong. In the "golden age" of the ancients their ancestors were wandering, half naked, through interminable woods, killing with flint lances the wild animals on which they fed, roasting them before a rude fire, fighting among themselves for the largest share, and when the flesh was consumed, cracking the bones of their prey to get at the marrow. The golden age has never existed. We have only just passed the age of wood, and entered upon that of iron, and it is our mission to extend and exalt its sway. The control and use of coal and the metals are but arts of civilization, nor do we stop at their ordinary use. We must not expect to plod in the old, deep-worn paths, but ever strive after the *Excelsior*. Every thing must be made better, quicker, cheaper. The first watch was a great achievement, but how much better we make them now. Were we satisfied with a fast line of coaches, at ten miles an hour? Are we to-day content with the locomotive, at thirty or forty? Do we not hope that better perfected materials and machinery will one day carry us one hundred miles an hour with no more

danger? We daily see animated machinery no larger than a man's hand, but made by the great Artificer, cleave the air at the rate of sixty miles an hour; or, as in the case of some carrier pigeons, even one hundred; and shall we stop short of this degree of perfection? The strength of our machinery on land exceeds that of Nature's; then why not imitate her in the air, and on the waves, or under them? If Nature's machinery can overcome the resistance of the elements, why cannot ours? Have the telegraph, photograph and telescope, reached the limit of their powers? We think not fully, nor perhaps, nearly. We have quick transmission of thought and faithful reproduction of feature and form; but we are not yet able to place the miniature landscape in all its gorgeous tints upon the photographer's plate, nor can we yet dispense with the slow old method of type setting. The electrotype, as yet, is only applied to a fraction of its future uses. The telegraph strikes one note; why not make it transmit harmonious melody? All these things are still waiting to be done.

The great treasures of Nature's arcana are but partially explored. The last hundred years have opened much to our view; where will the next hundred place us? Are all the coal fields explored? What will the interior of Africa reveal? We need more iron, to supply the world with a set of rails for every road; myriads of iron ships for every sea, besides ships for the air. We need a more speedy method of tunneling

through Alpine heights. We need to have air made as subservient as gas or water, to be carried in pipes and made to blow a whirlwind blast or flutter a lady's fan. These are but glimpses of a few drops from the ocean of knowledge which still remains to be explored.

Reviewing the past and with prophetic ken anticipating the future, we see that a small portion of the universe has been imperfectly developed. Nature's secret chambers are but partially opened, her vaults of gold and silver scarcely touched, her copper mines shining in but one great locality, her diamond fields few and far between, Africa but simply heard of, her oil wells merely in their beginning—all sufficient for our present population, but all too small for the coming myriads.

Nor does the Creator design us for mere parts of machinery, to manufacture His raw materials into the mechanism of civilization. He intends the education not of the hands alone, but of the head and the heart; to establish His great kingdom on the earth, not only in the University and in the College, but in the humblest school-house, and in all the workshops and homes of the world. Let all of us, individually and collectively, strive to study the elements and their combinations, and learn by obeying their laws to control them as readily as one man with a simple lever controls the ponderous train; but let us do all to the glory of the Creator and Controller of the Universe, and use our knowledge only in His service.

Year.	Lehigh. Tons.	Schuylkill. Tons.
1820	365	.....
1821	1,073	.....
1822	2,240	1,480
1823	5,823	1,128
1824	9,541	1,567
1825	28,393	6,500
1826	31,280	16,767
1827	32,074	31,360
1828	30,232	47,284
1829	25,110	79,973
1830	41,750	89,984
1831	40,966	81,854
1832	70,000	209,271
1833	123,001	252,971
1834	106,244	226,692
1835	131,250	339,508
1836	148,211	432,045
1837	223,902	530,152
1838	213,615	446,875
1839	221,025	463,147
1840	225,313	475,091
1841	143,037	603,003
1842	272,540	573,273
1843	267,793	700,200
1844	377,002	874,850
1845	429,453	1,121,724
1846	517,116	1,295,928
1847	633,507	1,650,831
1848	670,321	1,714,365
1849	781,656	1,683,425
1850	690,456	1,782,936
1851	964,224	2,229,426
1852	1,072,136	2,517,493
1853	1,054,309	2,551,603
1854	1,207,186	2,957,670
1855	1,284,113	3,318,555
1856	1,351,970	3,289,585
1857	1,318,541	2,985,541
1858	1,380,030	2,902,821
1859	1,628,311	3,004,953
1860	1,821,674	3,270,516
1861	1,738,377	2,697,439
1862	1,351,054	2,890,593
1863	1,894,713	3,433,265
1864	2,054,669	3,642,218
1865	2,040,913	3,735,802
1866	2,179,364	4,957,180
1867	2,502,054	4,334,820
1868	2,507,582	4,414,356
1869	1,929,523	4,821,253
1870	3,172,916	3,853,016
1871	2,116,682	4,209,266

By P. W. SHEAFER, Ed

L TRADE OF PENNSYLVANIA.

Wyoming. Tons.	Lyk's Valley, Shamokin. Tons.	Total Tons.
.....	.....	365
.....	.....	1,073
.....	.....	3,720
.....	.....	6,951
.....	.....	11,108
.....	.....	34,893
.....	.....	48,047
.....	.....	63,434
.....	.....	77,516
7,000	.....	112,083
43,000	.....	174,734
54,000	.....	176,820
84,000	.....	363,271
111,777	.....	487,749
43,700	.....	376,636
90,000	.....	560,758
103,861	.....	684,117
115,387	.....	869,441
78,207	.....	738,697
122,300	11,930	818,402
148,470	15,505	864,379
192,270	21,463	959,773
252,599	10,000	1,108,412
285,605	10,000	1,263,598
365,911	13,087	1,630,850
451,836	10,000	2,013,013
518,389	12,572	2,344,005
583,067	14,904	2,882,309
685,196	19,356	3,089,238
732,910	45,075	3,242,966
827,823	57,684	3,358,899
1,156,167	99,099	4,448,916
1,284,500	119,342	4,993,471
1,475,732	113,507	5,195,151
1,603,478	234,000	6,002,334
1,771,511	234,388	6,608,567
1,972,581	313,444	6,927,680
1,952,603	388,256	6,644,941
2,186,094	370,424	6,839,369
2,731,236	443,755	7,808,255
2,941,817	479,116	8,513,123
3,055,140	463,308	7,954,264
3,145,770	481,990	7,869,407
3,759,610	478,418	9,566,006
3,960,836	519,752	10,177,475
3,254,519	621,157	9,652,391
4,736,616	830,722	12,703,882
5,325,000	826,851	12,988,725
5,990,813	921,381	13,834,132
6,068,369	903,885	13,723,08
7,825,128	998,839	15,849,899
6,682,302	2,105,156	15,113,407

d Geologist, Pottsville, Pa